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# CORRELATION BETWEEN MATERNAL CHARACTERISTICS AND THE INCIDENCE OF COVID-19 IN PREGNANT WOMAN: A CROSS-SECTIONAL STUDY

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## ABSTRACT

**Background:** COVID-19 is an infectious disease that attacks the respiratory tract. In September 2021, there were 3.109.604 cases confirmed worldwide, as in Indonesia there were 4.026.837 cases confirmed. Pregnancy is considered as a risk factor because during pregnancy several physiological changes occur, namely increased expression of ACE2, changes in the respiratory system, and changes in the immune system, which make pregnant women more susceptible to SARS-CoV-2 infection with 3% rate of maternal death. **Objective:** This study aims to determine the relationship between the characteristics of pregnant women and the incidence of COVID-19. **Methods:** This observational analytic study used 51 samples of pregnant women, both infected with COVID-19 and those who were not, which were taken using a total sampling technique. The characteristics of pregnant women were taken through secondary data in the form of medical records at K.R.M.T. Wongsonegoro Regional Public Hospital Semarang, then analyzed univariately and bivariately using Spearman's test and contingency coefficient. **Results:** The results obtained from the bivariate analysis were p = 0.863 (> 0.005) for the comorbid history variable, p = 0.367 (> 0.005) for the body mass index variable, and p = 0.423 (> 0.005) for the hypertension incident variable. **Conclusion:** The results of this study concluded that there was no correlation between the characteristics of pregnant women (history of comorbidities, body mass index, and incidence of hypertension) with the incidence of COVID-19 in patients at K.R.M.T. Wongsonegoro Regional Public Hospital Semarang.
*Keywords: COVID-19 , characteristics, maternal, pregnancy, pregnant*

## INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease of the respiratory tract caused by Small Acute Respiratory Syndrome-Corona Virus-2 (SARS-CoV-2)[1]. This virus spreads through droplets and enters the human body through the Angiotensin Converting Enzyme 2 (ACE-2) receptor[2]. Pregnant women are one of the populations that are very susceptible to infection from SARS-CoV-2 because in pregnancy conditions, there are several physiological changes that cause pregnant women's susceptibility to viral infections to increase[3].

POGI recorded a number of positive cases in pregnant women with a significant mortality rate in July 2021[4]. Pregnancy is considered to have adverse side effects for COVID-19 patients, so most pregnant women infected with COVID-19 require intensive care[5]. COVID-19 in pregnant women can also cause some problems in their pregnancy[6]. COVID-19 not only cause complications in the mother, but also cause severe complications in the fetus[7]. The maternal mortality rate in the incidence of COVID-19 is quite low (1.6%), poor conditions can be found in some patients, including the ICU treatment needs rate (9.5%) and vascular complications in some pregnant women infected with COVID-19, including postpartum hemorrhage (0.94%) and abnormal coagulation associated with severe infections and organ malfunctions (0.94%)[8].

Several conditions in pregnant women are suspected to affect the incidence of COVID-19. Most pregnant women infected with COVID-19 are in the third trimester and are multipara. One of the maternal conditions related to bad outcomes in COVID-19 is older maternal age[9]. Maternal mortality in COVID-19 is related to several risk factors, including mothers suffering from comorbidities in the form of diabetes, chronic hypertension, and obesity[10].

Until now, research on the correlation between the characteristics of pregnant women and the incidence of COVID-19 is still very limited, so this study aims to determine the relationship between the characteristics of pregnant women including a history of comorbidities including diabetes mellitus, asthma, and, body mass index, and the incidence of hypertension with the incidence of COVID-19 at K.R.M.T. Wongsonegoro Regional Public Hospital Semarang.

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## METHODS

This study is an analytical observational study conducted using a cross-sectional design using secondary retrospective data in the form of medical records of patients treated at K.R.M.T Wongsonegoro Regional Public Hospital Semarang for the period of 2020 – 2021. Samples were determined by the total sampling method, where all patients from populations that met the inclusion and exclusion criteria were included in the study.

The inclusion criteria are pregnant women who are treated at K.R.M.T. Wongsonegoro Regional Public Hospital Semarang for the period 2020 – 2021 in all ages and pregnant women who are clinically diagnosed with COVID-19 with comorbidities in the form of gestational diabetes, hypertension, obesity, and asthma. Exclusion criteria are patients with incomplete medical records. The data taken from medical records are characteristic data of pregnant women which include a history of comorbidities (gestational DM, asthma), body mass index, and the incidence of hypertension. Data were processed univariately and bivariately using Spearman correlation analysis and contingency coefficients with the IBM SPSS Statistics 26 application.

## RESULTS

The study was conducted on the population of pregnant women treated at K.R.M.T. Wongsonegoro Regional Public Hospital Semarang. This research sample was obtained from the Medical Record section of K.R.M.T. Wongsonegoro Hospital Semarang and was selected based on inclusion and exclusion criteria. Based on the selection carried out, there were 51 samples with the following characteristics in the table 1.

Based on Table 1 above, results were obtained that most patients had no history of comorbidities (82.35%). The majority of pregnant women had a BMI of ≥23 (60.78%), and most of the respondents in this study did not experience hypertension (82.35%).

**Table 1.** Result of Univariate and Bivariate Analysis

| Variable | Total (n) | Percentage (%) | *p-value* |
|---|---|---|---|
| **History of Comorbidities** | | | 0,863 |
| With History of Comorbidities | 9 | 17,64 | |
| Without History of Comorbidities | 42 | 82,35 | |
| **Body Mass Index** | | | 0,367 |
| <18,5 | 1 | 1,96 | |
| 18 – 22,9 | 20 | 39,21 | |
| ≥23 | 31 | 60,78 | |
| **Incidence of Hypertension** | | | 0,423 |
| Without Hypertension | 42 | 82,35 | |
| Gestational Hypertension | 5 | 9,8 | |
| Preeclampsia | 4 | 7,84 | |
| Total | 51 | 100 | |

## DISCUSSION

### The Correlation Between History of Comorbidities with The Incidence of COVID-19

The findings of the study conducted at K.R.M.T. Wongsonegoro Regional Public Hospital Semarang, namely that the majority of patients present without history of comorbidities (82,35%) with the results of bivariate analysis is p = 0.863 for the variable history of comorbidity, meaning that there is no correlation between the history of comorbidity in pregnant women and the incidence of COVID-19 at K.R.M.T. Wongsonegoro Hospital Semarang.

The results of the study obtained are not in line with the theory stated that respiratory diseases and endocrine diseases are one of the primary risk factors for the incidence of COVID-19[11]. In metabolic diseases such as diabetes, there is a decrease in the regulation of ACE2-Angiotensin-(1 – 7)-Mas axis which can decrease the enzyme Angiotensin II in circulation, so that Angiotensin (1 – 7) decreases and oxidative stress occurs[12].

The results of this study can be attributed to the regulation of ACE-2 in pregnant women. Pregnant woman experience increasing expression of ACE-2 receptors that can cause an increase in levels of Angiotensin(1 – 7) in the circulation which can increase the anti-inlamation response so that it can be a protective factor against COVID-19 infection[13]. The level of expression of ACE-2 receptors that act as a protective factor didn't explained yet, but it was stated that in pregnant conditions, the increase in

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ACE-2 receptor levels activates another pathway of blood pressure regulation through Angiotensin(1 – 7)-MAS Axis, which can cause vasodilation, anti-inflammatory, and even protective effects on the lungs[13].

**The Correlation Between Body Mass Index with The Incidence of COVID-19**

The findings of the study conducted at RSUD K.R.M.T. Wongsonegoro Semarang, namely the majority of patients had a BMI of ≥23 (60,78%) with the results of bivariate analysis obtained p = 0.367, meaning that no correlation was obtained between the body mass index of pregnant women and the incidence of COVID-19 at K.R.M.T. Wongsonegoro Regional Public Hospital Semarang.

This is not in line with the research that has been done, probably because there are differences in operational definitions. Research on the population of pregnant women with COVID-19 infection explained that there is a significant relationship between the mother's body mass index, namely BMI >35 kg / m2, with the incidence of COVID-19 in pregnant women, although it has not been explained in the study regarding the mother's body mass index before pregnancy[14]. Pregnant women with abnormal weight conditions (underweight, overweight, or obese) before pregnancy are at high risk of adverse events and poor outcomes of COVID-19[15].

**The Correlation Between Incidence of Hypertension and The Incidence of COVID-19**

The findings of the study conducted at K.R.M.T. Wongsonegoro Regional Public Hospital Semarang are that the majority of patients have no history of hypertension (82,35%), both gestational hypertension and preeclampsia. In the bivariate analysis, the result p = 0.423 was obtained, meaning that there was no relationship between the incidence of hypertension in pregnant women and the incidence of COVID-19 at K.R.M.T. Wongsonegoro Regional Public Hospital Semarang.

The clinical findings obtained are in line with the findings which states that most pregnant women infected with COVID-19 do not suffer from comorbidities, one of which is hypertension[1]. However, the results of this study are not in line with the study explaining that cardiovascular congenital diseases in pregnant women, such as preeclampsia,

are also one of the significant risk factors for the incidence of COVID-19[14].

Theoretically therapy in hypertension, namely ACE-inhibitors and Angiotensin Receptor Blockers (ARBs) can increase the bond between SARS-CoV-2 and ACE2 receptors and cause pathophysiological effects that lead to lung damage, but the other research states that there is no clarity on whether patients with hypertension are more susceptible to COVID-19 or not, because in some experiments it was found that ACE2 is considered a protective factor against hypertension[11,16]. In normal pregnancies, the immunological shift of Th1-Th2 that is suspected to be the cause of the susceptibility of pregnant women to viral infections is compensated by the increased secretion of ACE2-Angiotensin-(1 – 7) which activates the Angiotensin(1 – 7)-MAS Axis pathway which is suspected to elicit a vasodilating and anti-inflammatory response[13].

This study has several limitations, including the research used secondary data that had been written in the medical record record at K.R.M.T. Wongsonegoro Regional Public Hospital Semarang so that it is difficult to assess previous conditions that can cause bias in clinical conditions, such as daily lifestyle, patient health before pregnancy, age, multi/nullipara, and so on. Previous research on the relationship between the characteristics of pregnant women and the incidence of COVID-19 is also still limited.

**CONCLUSION**

Analytical observational research on pregnant women with COVID-19 infection at K.R.M.T. Wongsonegoro Hospital Semarang concluded that the characteristics of pregnant women (history of comorbidities, maternal BMI, and incidence of hypertension) were not correlated to the incidence of COVID-19.

**ETHICAL APPROVAL**

This research is approved by K.R.M.T Wongsonegoro Regional Public Hospital Ethical Committee. Ethical Clearance No. B/070/428/VI/2022.

**CONFLICTS OF INTEREST**

The authors declare no conflicts of interest.

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